CLAIMS

What is claimed is:

1. A quantum well infrared photodetector (QWIP) device comprising:

an emitter contact layer;

a stack including a number of quantum wells, each well sandwiched between barrier layers; and

an electron launcher configured with a plurality of steps to enable dark electrons to move rapidly from the emitter contact layer into the stack, thereby reducing dielectric relaxation effect.

2. The device of claim 1 wherein a first barrier in the stack is defined by a particular semiconductor material make-up, and each step of the electron launcher adds about 25% or less of that first barrier's make-up.

3. The device of claim 1 wherein the device is configured as an indirect-gap type structure, and the quantum wells are GaAs and the barriers are AlGaAs.

4. The device of claim 1 wherein the device is configured as a strained type structure, and the quantum wells are InGaAs, and the barriers are AlGaAs.

5. The device of claim 1 wherein the quantum wells have a width of about 40 Å to 80 Å, and the barriers have a thickness of about 500 Å or more.

6. The device of claim 1 wherein the device further includes a collector contact layer that is proximate to a last barrier included in the stack.

7. The device of claim 6 wherein the device further includes a second electron launcher configured with a plurality of steps to enable dark electrons to rapidly move from the collector contact layer into the stack, thereby reducing dielectric relaxation effect during reverse bias applications.

8. The device of claim 6 wherein the device further includes a blocking layer between the stack and the collector contact layer for suppressing tunneling current from the quantum wells.

9. A quantum well infrared photodetector (QWIP) device comprising:

an emitter contact layer;

a stack including a superlattice structure of quantum wells, each well sandwiched between thin barrier layers that allow tunneling between the wells, thereby enabling rapid refilling of depleted wells and neutralization of space charge buildup; and

an electron launcher configured with a plurality of steps to enable dark electrons to move rapidly from the emitter contact layer into the stack, thereby reducing dielectric relaxation effect.

10. The device of claim 9 wherein a first barrier in the stack is defined by a particular semiconductor material make-up, and each step of the electron launcher adds about 25% or less of that first barrier's make-up.

11. The device of claim 9 wherein the device is configured as an indirect-gap type structure, and the quantum wells are GaAs and the barriers are AlGaAs.

12. The device of claim 9 wherein the device is configured as a strained type structure, and the quantum wells are InGaAs, and the barriers are AlGaAs.

13. The device of claim 9 wherein the quantum wells have a width of about 60 Å to 90 Å, and the barriers have a thickness of about 45 Å to 65 Å.

14. The device of claim 9 wherein the device further includes a collector contact layer that is proximate to a last barrier included in the stack.

15. The device of claim 14 wherein the device further includes a blocking layer between the stack and the collector contact layer for suppressing tunneling current from the quantum wells.

16. A quantum well infrared photodetector (QWIP) device comprising:

a stack including a number of quantum wells, each well sandwiched between barrier layers; and

an electron launcher configured with a plurality of steps to enable dark electrons to move rapidly from a contact layer into the stack, thereby reducing dielectric relaxation effect.

17. The device of claim 16 wherein a first barrier in the stack is defined by a particular semiconductor material make-up, and each step of the electron launcher adds about 25% or less of that first barrier's make-up.

18. The device of claim 16 wherein the device further includes a blocking layer that is proximate to an end barrier of the stack for suppressing tunneling current from the quantum wells.

19. The device of claim 16 wherein the stack is configured to detect multiple wavelengths.

20. The device of claim 16 wherein the device further comprises:

an emitter contact layer that is proximate to a first end barrier of the stack; and

a collector contact layer that is proximate to a second end barrier of the stack.